DOCUMENT RESUME

ED 432 458 SE 062 535

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TITLE Student Drawings as Course Evaluations: What They See in Statistics.
PUB DATE 1999-04-20
NOTE 45p.; Paper presented at the Annual Meeting of the American Educational Research Association (Montreal, Quebec, Canada, April 19-23, 1999).
PUB TYPE Reports - Descriptive (141) -- Speeches/Meeting Papers (150)
EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS *Classroom Environment; College Students; Cooperative Learning; *Course Evaluation; *Freehand Drawing; Higher Education; Mathematics Education; *Statistics

ABSTRACT

This paper presents students' drawings of a classroom experience in a statistics course. The drawings offer proof of ways in which teaching practice was effective and also provide an opportunity to understand how students perceive their peers. Included with the drawing exercises were instructions to describe scenes and offer insights into what the drawings have to offer by way of course evaluation information that the scannable forms were not able to convey. (ASK)

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ED 432 458

Student Drawings as Course Evaluations: What They See in Statistics

by
Larry H. Ludlow

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Larry H. Ludlow
Boston College, School of Education
Paper presented at AERA: Montreal, April 20, 1999

STUDENT DRAWINGS AS COURSE EVALUATIONS: WHAT THEY SEE IN STATISTICS

Imagine you have just presented a lecture on maximum likelihood estimation and the operation of the Newton-Raphson iteration technique to your doctoral students. You have presented this topic a half dozen times in your career. Tonight, however, you feel you have actually "taught" the students how the technique works and why knowing about it is important. You even believe you have made the topic interesting, if not exactly exciting. Bottom-line, you have answered the ultimate questions, "So what?" and "Who cares?"

As you look at the students, awaiting their applause, a thought occurs, "What are *they* thinking?" You ponder this question as they file out of the room. There is no applause, no wave, no cheers, not even a "Nice job, Doc!" You wonder how they describe this class to their friends. What visual images do they construct for their audiences?

Over the next couple of days you ask a few students what they thought about the lecture. Did they understand it reasonably well? Was it clear? Did it make sense? Was it at their level? Where were the tough parts? Where did they begin to lose it? Their responses are non-descript--it was fine, it was interesting to see how the parts fit together, it made sense at the time, it was challenging but OK. Their responses, while somewhat supportive of your efforts, don't leave you satisfied. So you decide to try something unusual in the next class. At the start of the next class session you ask them to complete the following task:

> (1) Think of a "typical" classroom teaching experience this semester with me. Now draw as best as you can, that classroom experience. Include me, yourself, and anything else that represents for you that "typical" classroom experience. Ideally,

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someone else could look at your drawing and could then form a reasonable impression of your experience.

(2) On the back of your drawing write a full description of the scene you have drawn. Be as explicit, open, and comprehensive as you can.

The class ripples with giggles. Students look at one another. Puzzled expressions are exchanged. Whispers and groans are heard. Some of them look at you as if you have gone really weird on them this time. Eventually they begin to draw.

Theoretical Framework

Since 1983 I have taught graduate level statistics and psychometrics courses. Consistent with recent calls for reform of college level statistics, particularly with respect to cooperative learning (Garfield, 1993; Giraud, 1997), I have tried to integrate small-group, interactive learning activities into the formal lecture periods. In addition, I've tried to incorporate the ideas of context-relevant material (Sowey, 1995), tried to devise alternative forms of testing and grading (Garfield, 1994), and tried to team teach the statistical software component of courses (Rumsey, 1998). Since the material changes somewhat from one year to the next, including the text, as do the exams, assignments, and teaching assistant it is problematic when I think about how to gauge the extent to which such pedagogical changes have been effective. Although I pass out the standard end-of-course evaluation forms required at my university, it is apparent that the evaluations give me little information about student experiences in my classes. When I learned in 1995 that elementary and middle school students were drawing interesting pictures of their classrooms that were useful to teachers (Weber & Mitchell, 1995; Haney, et al, 1998; Gulek, in progress), I decided to try the drawing technique in my classes as a means of obtaining additional course evaluation feedback. To my amazement and delight, the drawings are rich beyond any expectation I held for them.

Figures 1 and 2 were drawn by two students at the start of one of the final sessions of an Intermediate Statistics II class. From my perspective, Figure 1 reflects the kind of positive classroom experience we wish we had on students every night we stand before them. The statements bursting from my head make sense. I come across as a person, even a personality-- "Yoda." There is a discernible message on the chalk board. The student doesn't even draw any stereotypical equations, numbers, curves or tables. Most dramatic of all, however, is the student's role. "Luke" is experiencing the "ah-ha" rush of insight that I have never seen represented as effectively as it is here. The relation implied between "Yoda" and "Luke" could probably comprise an article in its own right.

This scene is even more impressive in that it was drawn at the end of the semester yet this particular lecture took place about two months earlier. The distinction I was trying to make between the mechanics of statistical analysis involving computation versus data analysis involving interpretation and research design seems to have been grasped by this student.

Figure 2, however, is disturbing, chilling, even embarrassing. The board work and "statement bubble" leave no doubt that the material, maybe including me, is "BS" to this student. The belt buckle is even bothersome. I don't have one like it and its pentagram design suggests, to me, that this is the "course from hell." These images are not ones that we would like students to take away from our classes.

Data Sources

I now have drawing data from seven different graduate courses that I teach-- Interpreting & Evaluating Research (master's students), Statistics I (master's & PhD), Statistics II (master's & PhD), Multivariate I (PhD), Multivariate II (PhD). Psychometrics (PhD), and Seminar in Advanced Statistical Analysis (PhD). The courses cover a four year time span and most of them have been taught (and drawn) more than once. Some courses follow a traditional lecture format (Mult I, Mult II, Psychometrics), the others include a

cooperative learning component. The students are all enrolled in a department of education. They are required to take the first three courses listed above. Students in the four higher level courses specialize in measurement, evaluation, and statistical analysis.

The "drawing evaluation" is performed immediately following their completion of the standard evaluation form. They are told that the drawing evaluation is part of a long-term research project and I encourage them to take the exercise seriously. They are also asked to write an arbitrary four-digit code of their choice on their scannable evaluation forms and their drawing. They place the standard evaluations into a folder that another student takes to the Dean's office. They place the drawings onto a pile that they are encouraged to look at and discuss after everyone has completed the task.

Results

The drawings offer numerous ways in which the extent to which changes in teaching practice have been effective. For example, I have drawings from Stat I and Stat II in one year prior to incorporating cooperative activities and drawings from the same two courses in the next year after small-group activities were introduced. One noticeable feature in the first drawings are the representations of the class environment in terms of traditional rows of seats while in the following year there are numerous drawings of groups of seats with arrows representing lines of communication going back and forth between the seats.

The effect of class size is seen in the Interpreting and Evaluation Research course. The first three sets of drawings for this course clearly show the small-group, highly interactive aspect of the course. The next sets of drawings in the sequence show the effect of a doubling of class size. A noticeable proportion of the drawings revert back to a traditional representation of rows of seats (even with the same small-group component).

Other aspects of teaching practice are possible to investigate. How is the instructor represented--do I face the students or the board? What board work do the students represent--is it a mess of equations or plots and graphs? What resources are represented--is

it predominately a board or are there computers, texts, projectors, and manuals? How is change in learning represented--a drawing with three parts labeled "wk1" with three question marks over a stick figure of a student, then "wk3" with two question marks, finally "wk5" with a question mark scratched through and a little light bulb drawn? How do the drawings differ as a function of statistical sophistication--do they become more coherent, focused, technical, and interesting as the students progress through the statistics sequence? Are there particular topics that tend to be drawn for specific classes--do z scores stand out in Statistics I drawings while matrix operations stand out in Multivariate I?

The drawings also provide an opportunity to understand how students perceive their peers. The perceptions students have of their peers is beautifully illustrated in a Multivariate I drawing where groups of counseling psychology, human development, and measurement, evaluation and statistical analysis students are seated together in different regions of the class. It is not unusual that students sit with their program peers but it is noteworthy when the drawings also contain images of dead fish over one group, question marks over another, and three dimensional box-like diagrams with vector projections over the other. Because some of these students were enrolled in multiple courses with me it is even possible to identify individual students who were drawn by their peers as particularly noteworthy participants in class discussions.

Educational Importance

Included with the drawing exercises were instructions to describe the scenes and to offer their insights into what their drawings have to offer in the way of course evaluation information that the scannable forms were not able to convey. The following written statement by a student illustrates the point of this research: "This type of evaluation may get to the heart of the class-what the atmosphere is like-that's what can make or break a class!" In addition, the personal codes they provided on their standard forms and drawings provide a means to investigate the relation between quantitative ratings and qualitative drawings.

Finally, it is possible to investigate instructor ratings in the same course before-and-after implementation of cooperative learning activities.

All of us who teach statistics, particularly to non-specialists in departments of education, are well aware of the negative attitude and belief systems that many students carry as baggage to required statistics courses (Gal & Ginsburg, 1994; Yilmaz, 1996). Those attitudes and beliefs are not necessarily well communicated on standard course evaluation forms. Even more of a problem from our standpoint as instructors is the inability of students to effectively articulate changes in negative attitudes and beliefs. Scenes with "ah-ha's", dead fish, light bulbs, and tear-drops effectively communicate what students have felt in my classes. Those impressions make me think about what I now do in class in ways that never occurred to me before.

Although there are issues of reliability and validity in the interpretation of these drawings, these drawings do encourage self-reflection and inquiry. While I recognize the dangers of self-promotion, over-interpretation, exaggeration and other forms of subjective bias, I also believe that the gestalt portrayed in these drawings is so powerful that they offer a unique opportunity to combine qualitative data with quantitative course evaluation data in order to yield a richer understanding of the psychological dynamics underlying student experiences in class.

Format:

Roundtable consisting of sets of drawings to illustrate various aspects of student experiences and their implication for teaching practice.

References

Gal, I. & Ginsburg, L. (1994), "The Role of Beliefs and Attitudes in Learning Statistics: Towards an Assessment Framework," *Journal of Statistics Education* [Online], 2(2).

Garfield, J. (1993), "Teaching Statistics Using Small-group Cooperative Learning," *Journal of Statistics Education* [Online], 1(1).

Garfield, J.B. (1994), "Beyond Testing and Grading: Using Assessment to Improve Student Learning," *Journal of Statistics Education* [Online], 2(1).

Giraud, G. (1997), "Cooperative Learning and Statistics Instruction," *Journal of Statistics Education* [Online], 5(3).

Gulek, C. (in progress), "Using Multiple Means of Inquiry to Gain Insight Into Classrooms: A Multi-trait Multi-method Approach," Ph.D. dissertation: Boston College, School of Education.

Haney, W., Russell, M., Gulek, C. & Fierros, E. (Jan/Feb. 1998), "Drawings on Education: Using Student Drawings to Promote Middle School Improvement," *Schools in the Middle: Theory into Practice*, 38-43.

Rumsey, D.J. (1998), "A Cooperative Teaching Approach to Introductory Statistics," *Journal of Statistics Education* [Online], 6(1).

Sowey, E.R. (1995), "Teaching Statistics: Making it Memorable," *Journal of Statistics Education* [Online], 3(2).

Weber, S. & Mitchell, C. (1995), *That's Funny, You Don't Look Like a Teacher*, Washington, D.C.: Falmer.

Yilmez, M.R. (1996), "The Challenge of Teaching Statistics to Non-specialists," *Journal of Statistics Education* [Online], 4(1).

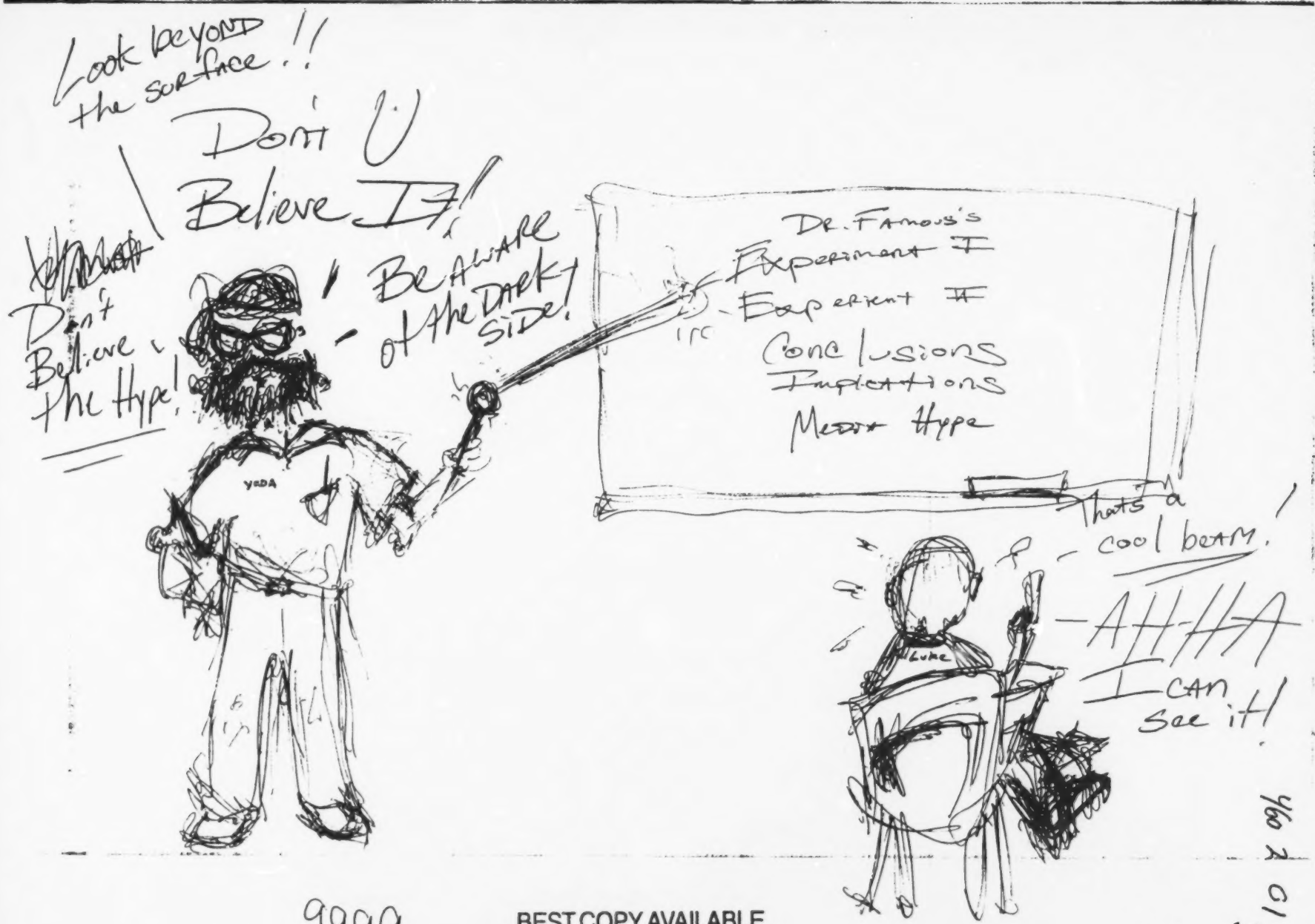

FIGURE 1

460 x 01

9999

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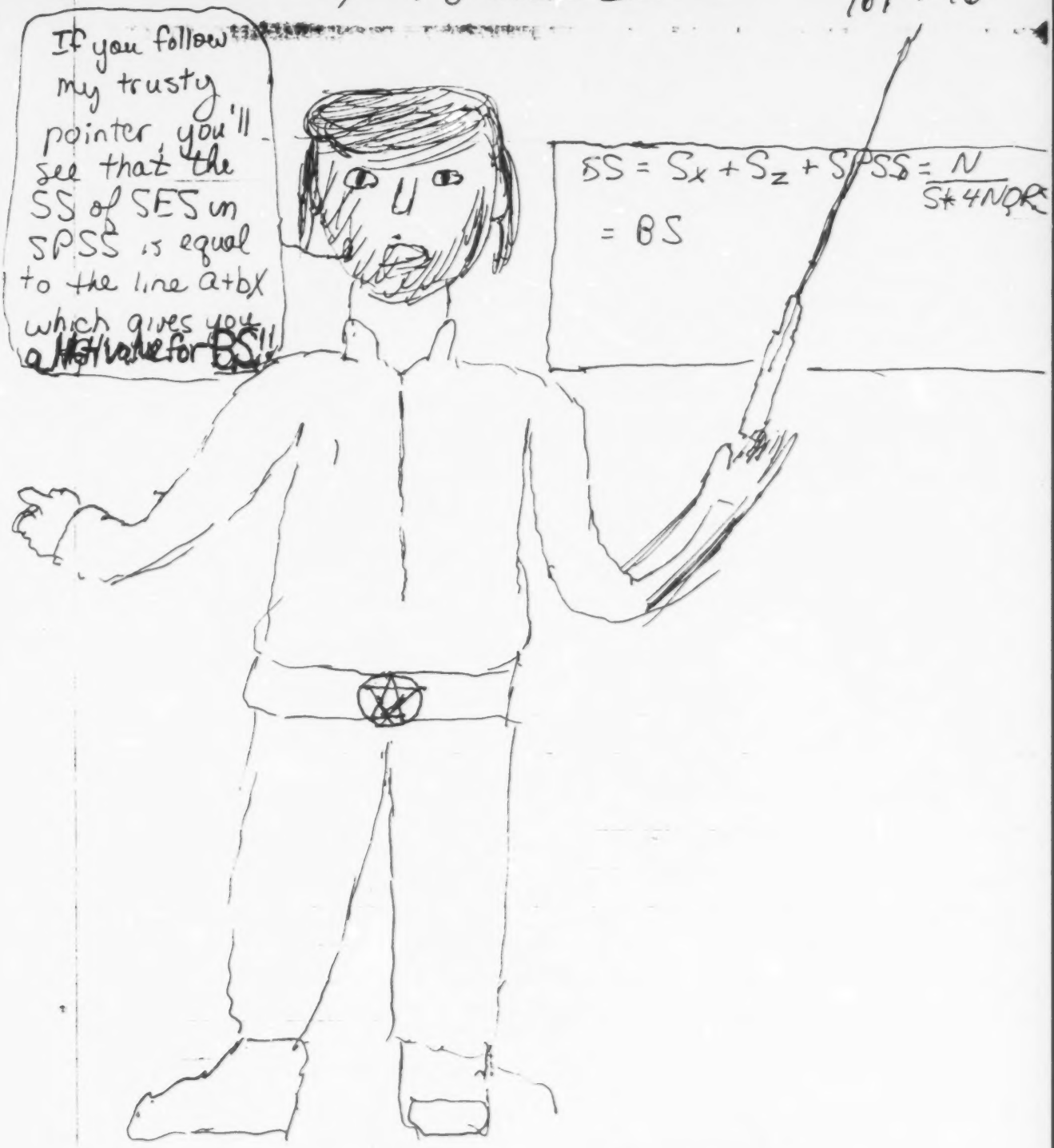
FIGURE 11

469 : 16


If you follow my trusty pointer, you'll see that the SS of SES in SPSS is equal to the line a+bX which gives you a ~~Mean~~ value for BS!!
SS = Sx + Sz + SPSS = N / S*4NQR
= BS

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STUDENT DRAWINGS AS COURSE EVALUATIONS: WHAT THEY SEE IN STATISTICS

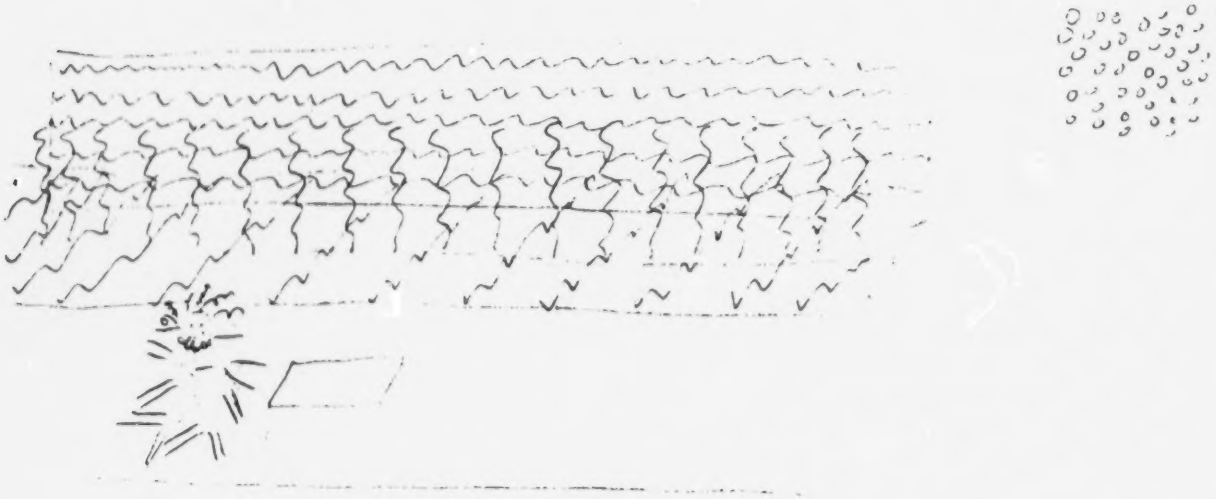
AHA!

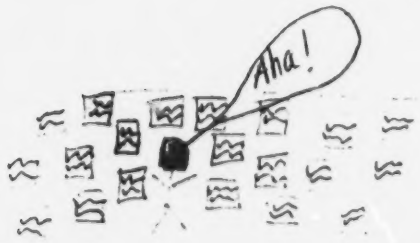
468-2-02

DRAWING INSTRUCTIONS FOR COURSE EVALUATION

(1) Think of a "typical" classroom teaching experience this semester with me. Now draw as best as you can, that classroom experience. Include me, yourself, and anything else that represents for you that "typical" classroom experience. Ideally, someone else could look at your drawing and could then form a reasonable impression of your experience.
(2) On the back of your drawing write a full description of the scene you have drawn. Be as explicit, open, and comprehensive as you can.
(3) Finally, what "course evaluation" information does your drawing provide that your responses to the traditional scannable form do not contain?

Please try to accept my assurance to you that this information is confidential-I will not try to somehow figure out who passed in which one of these sheets. This information is part of a long-term research project that I am conducting on alternative modes of faculty evaluation assessment techniques.





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STUDENT DRAWINGS AS COURSE EVALUATIONS: WHAT THEY SEE IN STATISTICS

CONFUSION

42

DRAWING INSTRUCTIONS 664-1-02

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On the back of your drawing write a full description of the scene you have drawn. Be as explicit, open, and comprehensive as you can.

In addition, what "course evaluation" information do these drawings offer that the traditional scannable forms do not contain?

STUDENT DRAWINGS AS COURSE EVALUATIONS: WHAT THEY SEE IN STATISTICS

STRUCTURE LECTURES

555

This is what you need to know.

The definition is _____.

The formula is _____.

Tommorrow we will _____.

At last, some structure

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468 / 10

STUDENT DRAWINGS AS COURSE EVALUATIONS: WHAT THEY SEE IN STATISTICS

COOPERATIVE LEARNING EXPERIENCE

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2025

Welcome to ED 460 - Cooperative Learning!

460 2 03

STUDENT DRAWINGS AS COURSE EVALUATIONS: WHAT THEY SEE IN STATISTICS

CONTRASTS IN THE CLASSROOM LAYOUT

468-2-21

2121

DRAWING INSTRUCTIONS FOR COURSE EVALUATION

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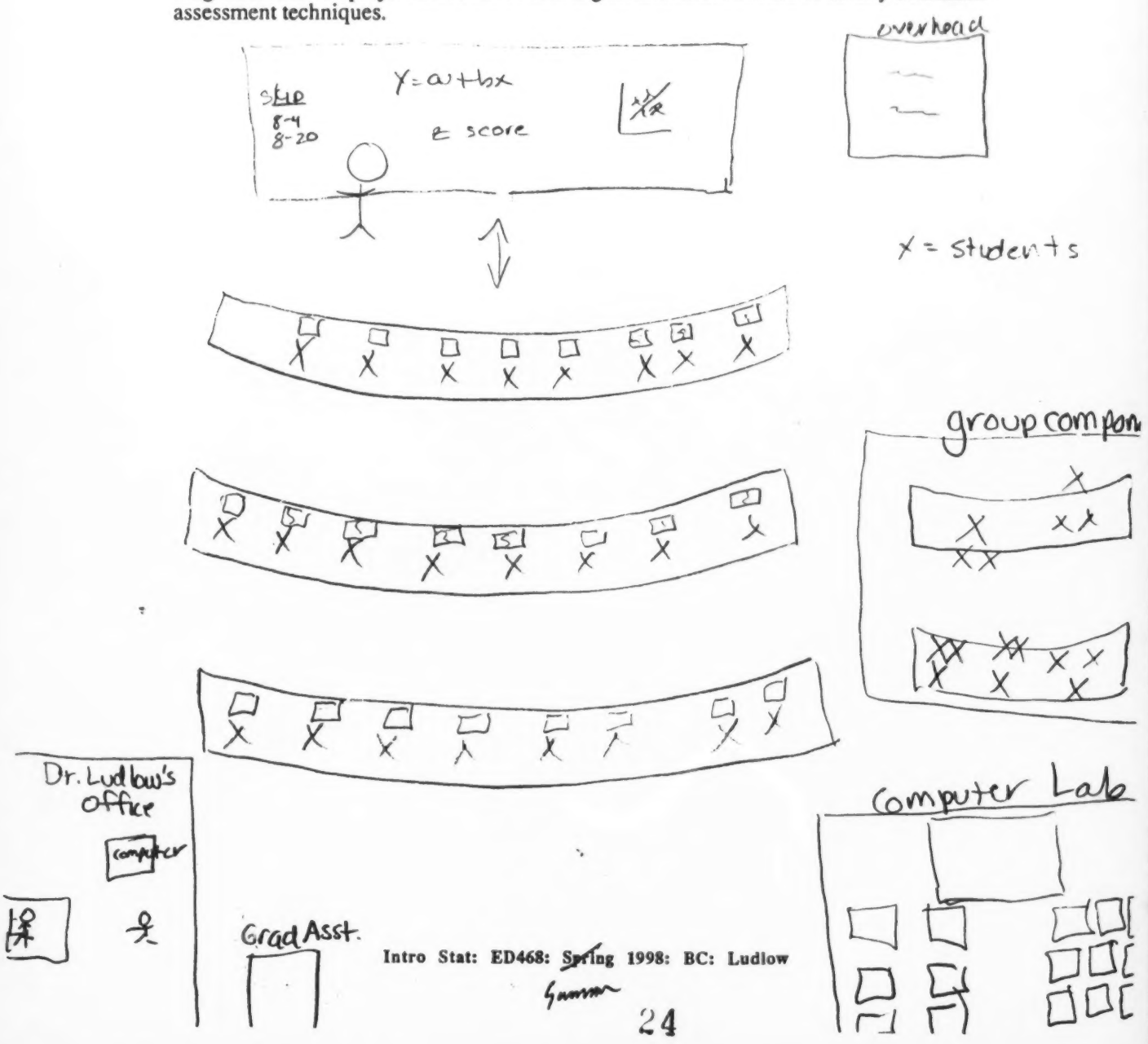
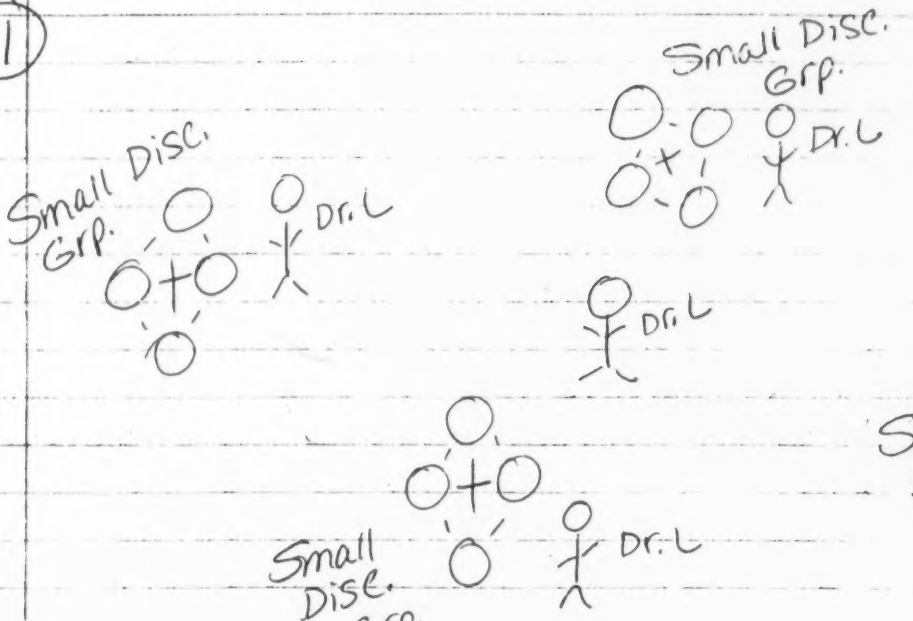


CAPE
4602 05

Over →

(1)



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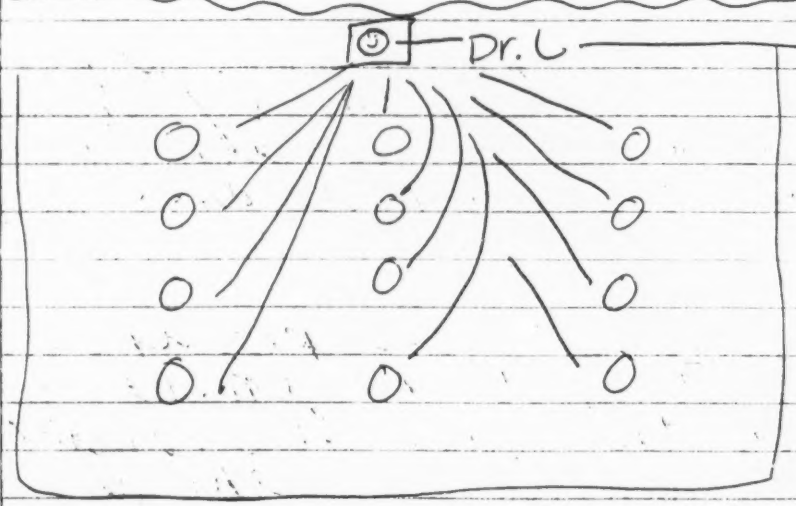
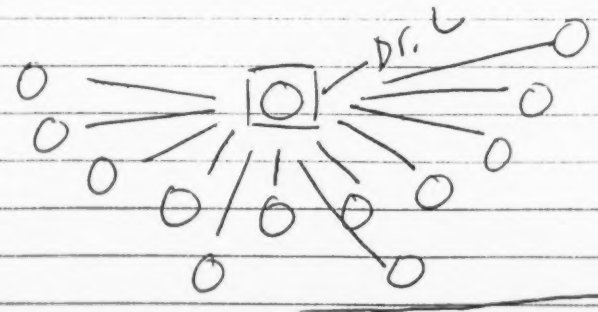


During lecture

(3)



— Our class the last few nigh of class. During lecture.

STUDENT DRAWINGS AS COURSE EVALUATIONS: WHAT THEY SEE IN STATISTICS

PROGRESS IN INDIVIDUAL LEARNING

460-3-03 24

DRAWING INSTRUCTIONS FOR COURSE EVALUATION

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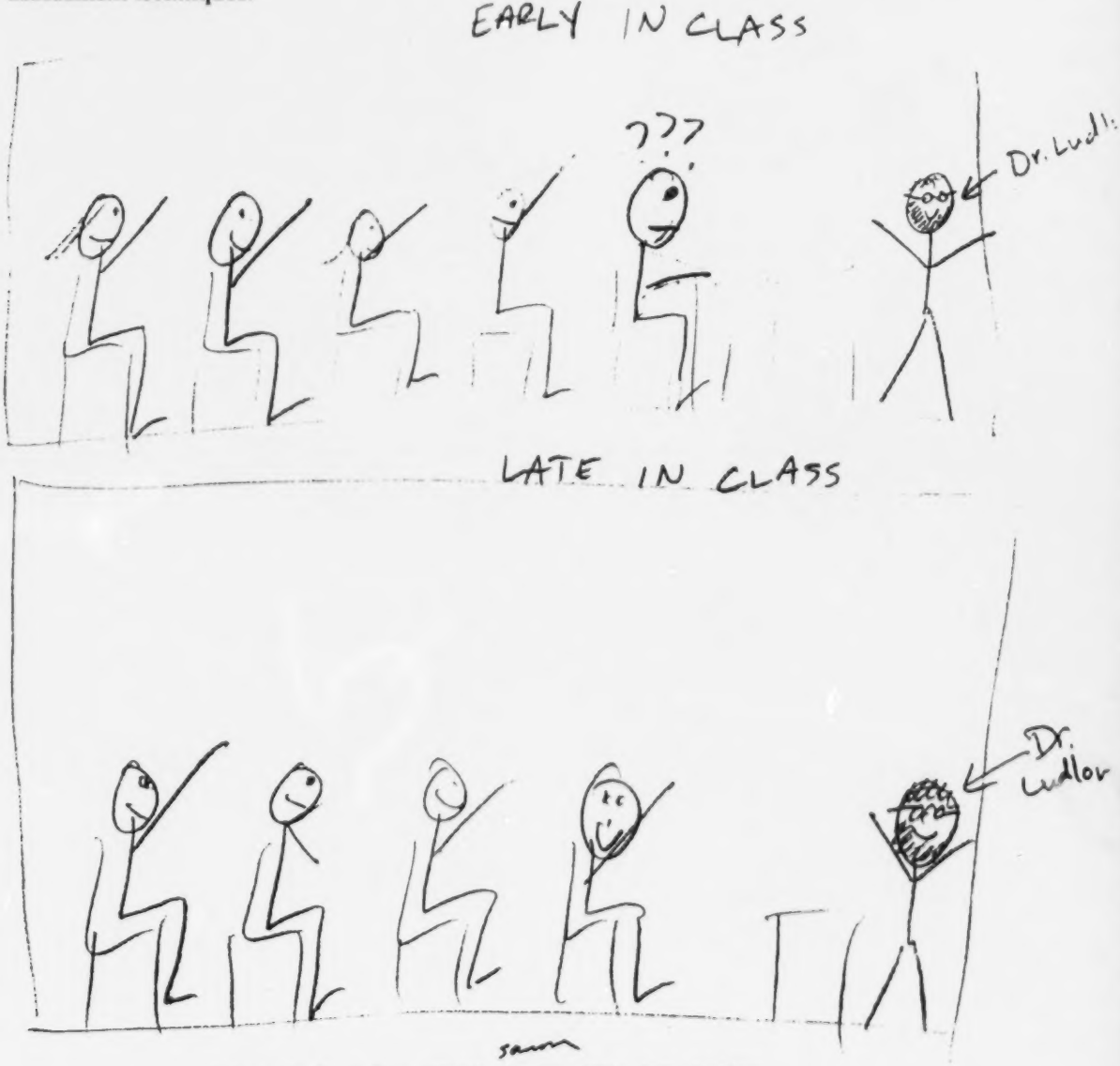

Interp & Eval Res: ED460: ~~Spring~~ 1998: BC: Ludlow

T T T T

"studies show ...."

"experts say ...."

"statistics prove ...."

Before	After
It must be true	what? why? where? who? when? SO WHAT? WHO CARES?

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460 1 02

STUDENT DRAWINGS AS COURSE EVALUATIONS: WHAT THEY SEE IN STATISTICS

SMILES

460-3-01 47

DRAWING INSTRUCTIONS FOR COURSE EVALUATION

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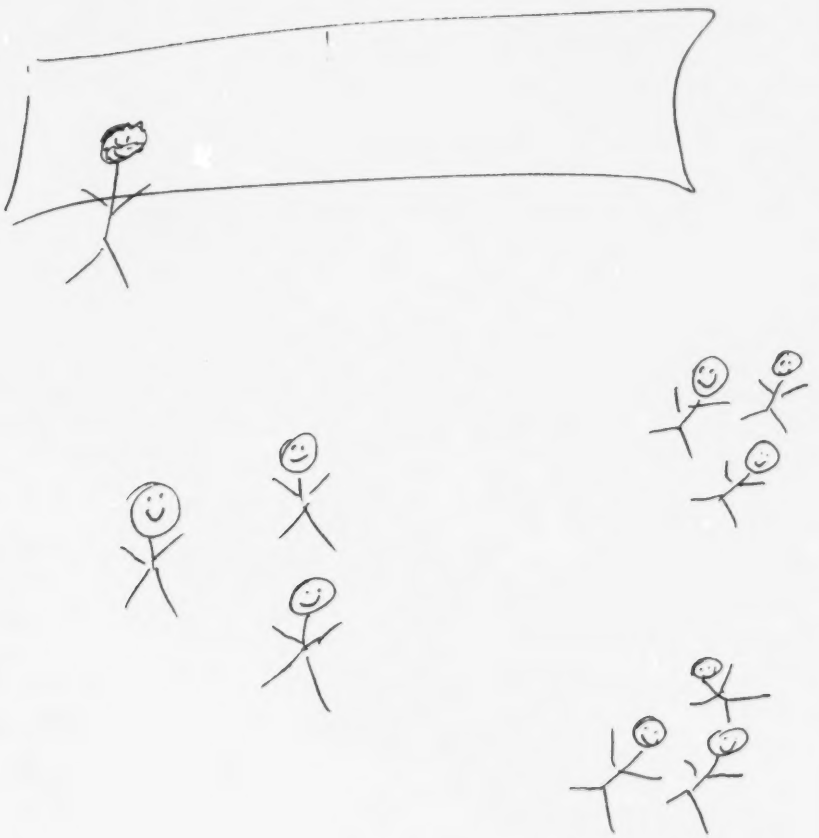

Interp & Eval Res: ED460: Summer Spring 1998: BC: Ludlow

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460-3-26 0815-18

DRAWING INSTRUCTIONS FOR COURSE EVALUATION

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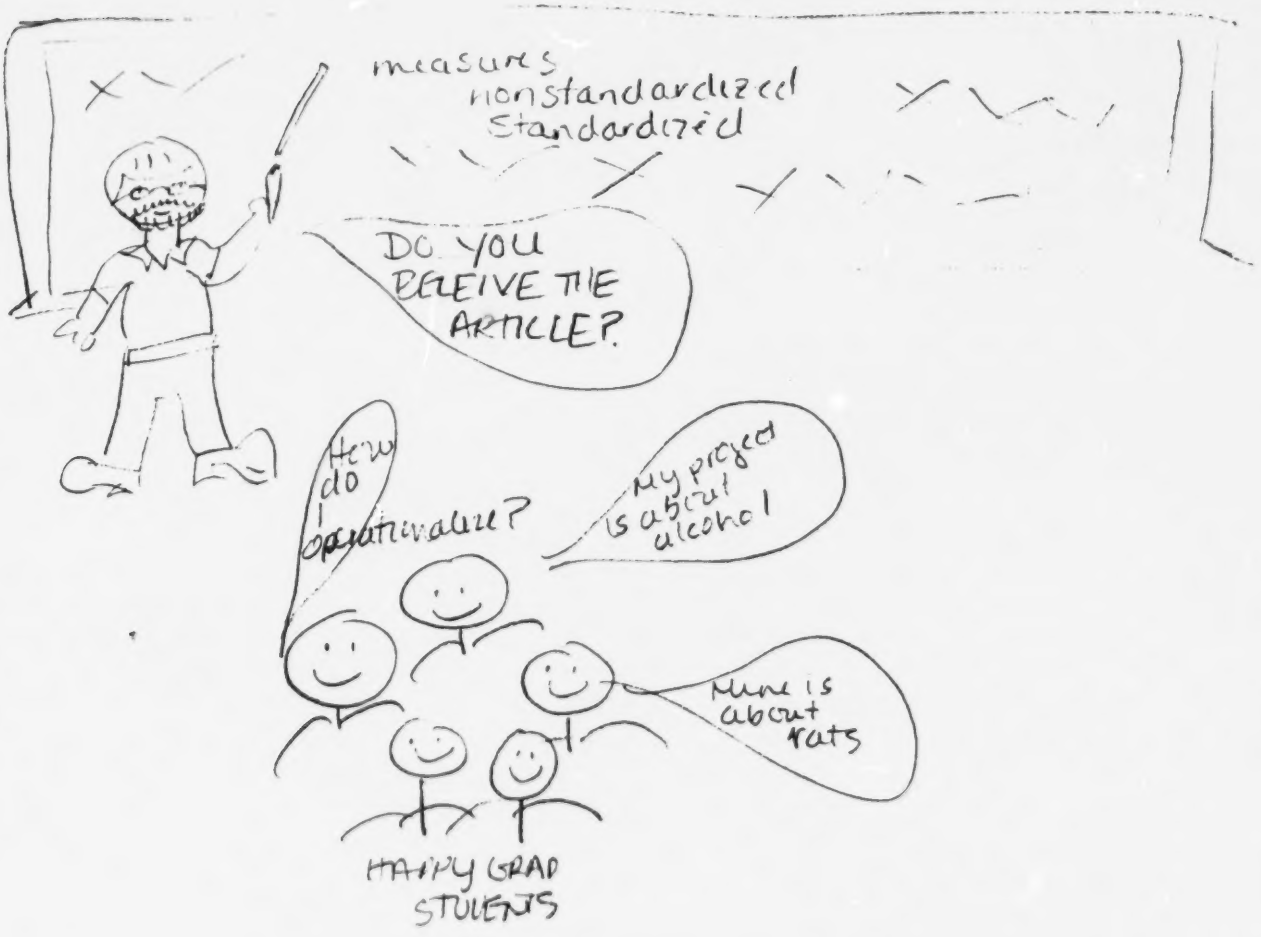

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STUDENT DRAWINGS AS COURSE EVALUATIONS: WHAT THEY SEE IN STATISTICS

WHAT DO THEY RECALL ABOUT WHAT WAS SAID

469103

So as you can see I've got the world back together again
It's really that simple class. I'm not trying to confuse you...
Please note current book's binding has no marks of being overly used.
remote

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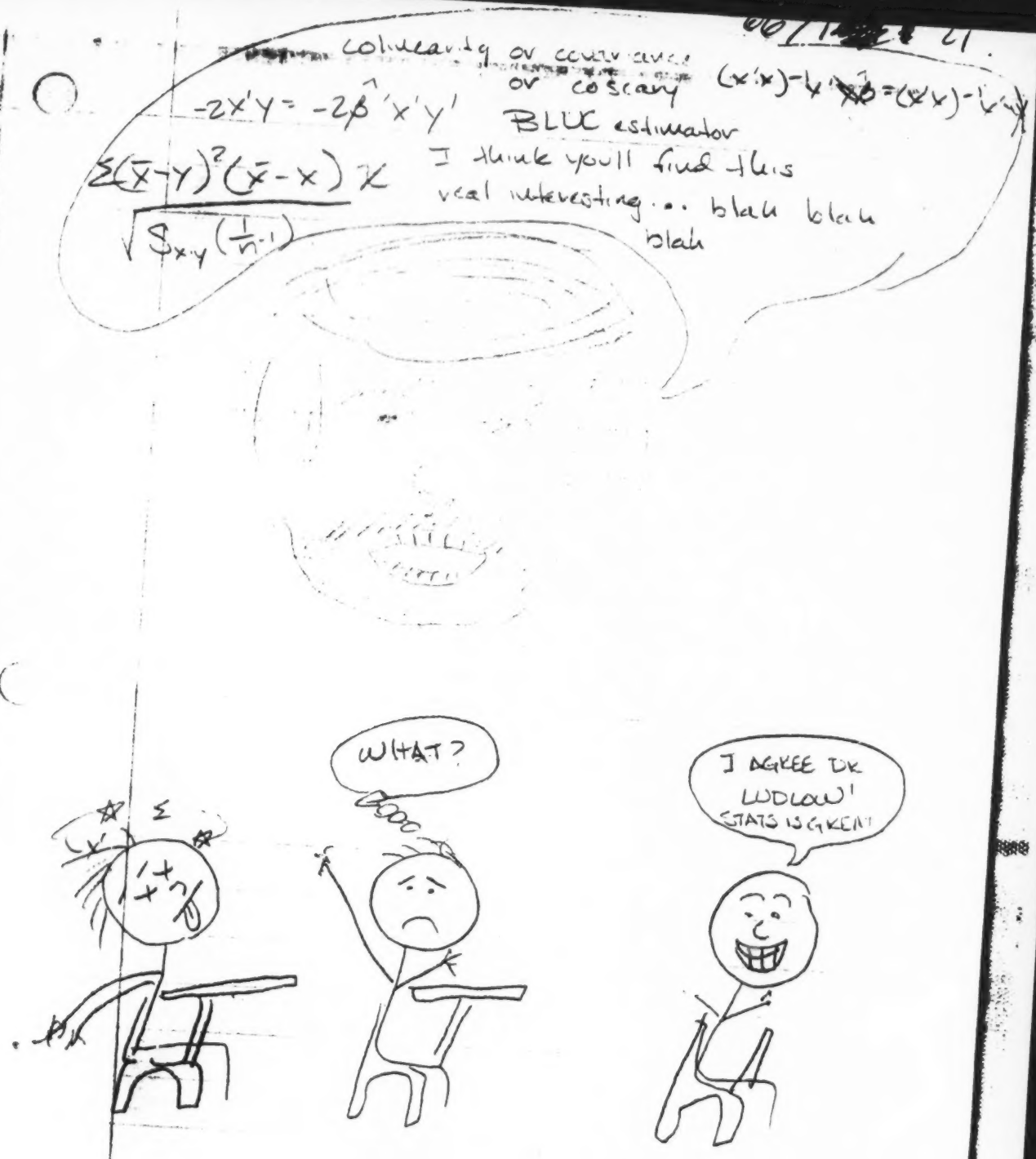
STUDENT DRAWINGS AS COURSE EVALUATIONS: WHAT THEY SEE IN STATISTICS

ADVANCED STATISTICS EXPERIENCE

Ludlow / Mult. L.
Fall '96
6671 10

STUDENT DRAWINGS AS COURSE EVALUATIONS: WHAT THEY SEE IN STATISTICS

HOW THEY SEE THEIR FELLOW STUDENTS



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DRAWING INSTRUCTIONS 669-1-01 XyzPDQ

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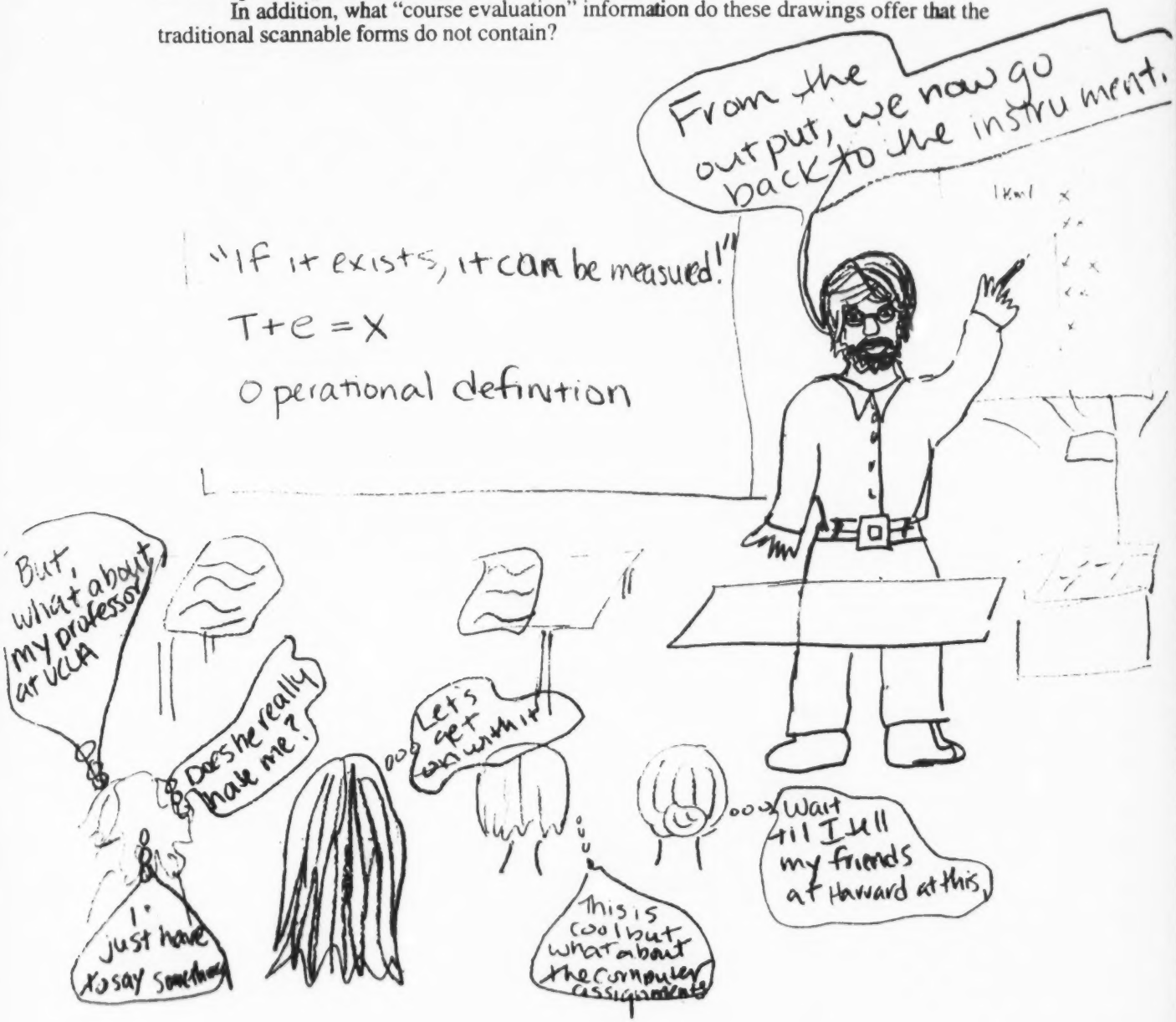
From the output, we now go back to the instrument.
"If it exists, it can be measured!"
T+e=X
Operational definition
But, what about my professor at UCLA
Does he really have me?
I just have to say something
Let's get on with it
This is cool but what about the computer assignments
Wait till I tell my friends at Harvard at this

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STUDENT DRAWINGS AS COURSE EVALUATIONS: WHAT THEY SEE IN STATISTICS

PERSONAL CHARACTERISTICS OF THE INSTRUCTOR

669-1-06

STEEP
C'MON IN. I AM for the people!
DR LUDLOW'S Office HOURS
DR LUDLOW
8:00 A.M UNTIL
RAIN, SLEET OR SNOW SO COME ON IN!
ONE Quick Question
DR L. is for the People!

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469-2-20 1993

DRAWING INSTRUCTIONS FOR COURSE EVALUATION

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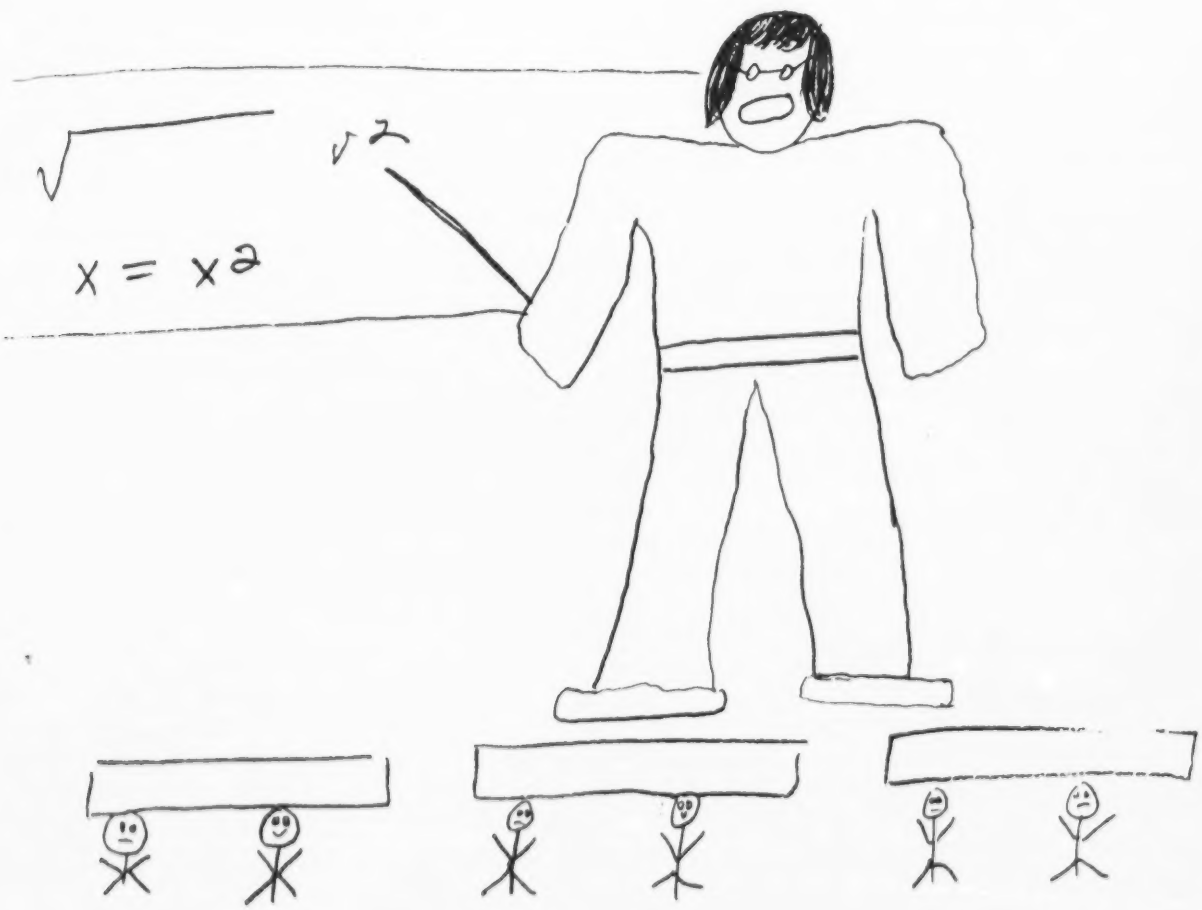

STUDENT DRAWINGS AS COURSE EVALUATIONS: WHAT THEY SEE IN STATISTICS

CREATIVE EXPRESSIONS OF THE STATISTICS EXPERIENCE

469-2-11

2468

DRAWING INSTRUCTIONS FOR COURSE EVALUATION

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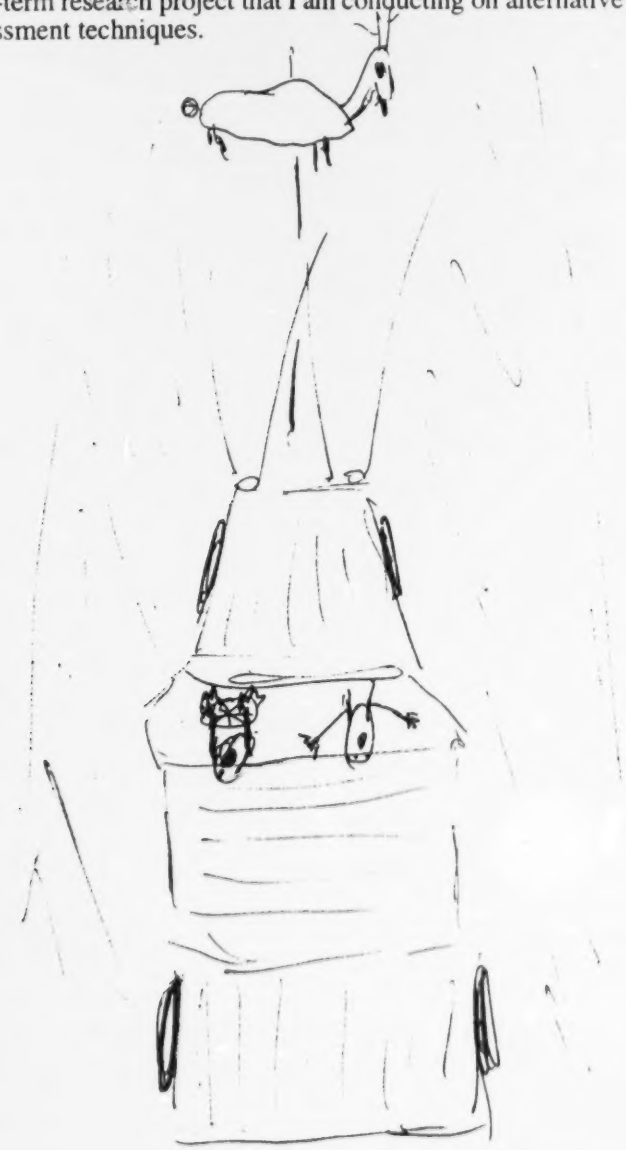

AXX

667-2-C1

DRAWING INSTRUCTIONS FOR COURSE EVALUATION

(1) Think of a "typical" classroom teaching experience this semester with me. Now draw as best as you can, that classroom experience. Include me, yourself, and anything else that represents for you that "typical" classroom experience. Ideally, someone else could look at your drawing and could then form a reasonable impression of your experience.

(2) On the back of your drawing write a full description of the scene you have drawn. Be as explicit, open, and comprehensive as you can.

(3) Finally, what "course evaluation" information does your drawing provide that your responses to the traditional scannable form do not contain?

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